INTREPID spatial and time domain filters and transformations (R13)

Top

INTREPID tools use a range of filters and transformations in the spatial and time domains. This appendix summarises the filters and transformations and gives details about their parameters. Some tools allow you to change parameters, whereas for other tools their values are fixed. This appendix shows which parameters may be set for each tool. See the chapter corresponding to the tool for further details about this.

INTREPID tools use the following spatial / time filters and transformations

- User defined convolution kernel
- Fuller filter
- Naudy filter
- 4th difference function
- Gradient
- Automatic gain control
- Contrast normalisation
- Hilbert transform
- Phillips auto depth estimation
- Gravity Inversion
- Strip gravity layer
- Butterworth
- Recursive RC filter
- Hilbert Pair convolutions for Falcon
- Spectral derivatives and integrations
- Quaternions, as a linear method for manipuating and filtering rotations
- 2d/3d complex tensor filters
- Infinite Impulse and Finite impulse methods are used as required.
- Isostatic correction uses the Bessel function integral.

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Availability in INTREPID tools

The following table shows the filters and transformations used in each INTREPID tool. The notation 'Y' indicates that the tool uses the filter or transformation

Availability of spatial filters in INTREPID tools	User defined kernel	Fuller filter	Naudy Filter	4th Difference	Gradient	Local mean filter	Local median filter	Local maximum filter	Automatic gain control	Contrast normalisation	Hilbert transform	Phillips auto depth	Bessel
Profile Editor			Y	Y	Y								
Gridding		Y	Y								Y	Y	
Levelling (crossovers calculation)		Y	Y										
Line Filter	Y	Y	Y			Y	Y	Y	Y		Y	Y	
Decorrugation		Y	Y										
Microlevelling		Y	Y										
Spatial Convolution Grid Filters	Y					Y*	Y	Y		Y			
Equivalent Layer	Y												
Isostatic													Y
Spectral grid filtering	Y				Y						Y		
Spectral Voxet filtering	Y				Y								

* The local mean filter is available as one of the user defined kernels

The filters listed in this section carry one or two icons denoting whether they are available in the Spectral Domain Grid Filters tool and/or the Line Filter tool.

This icon indicates that the filter is available for use with line datasets.

This icon indicates that the filter is available for use with grid datasets.

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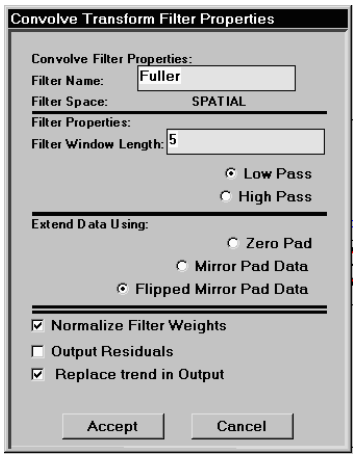
Standard spatial / time filter / transformation dialog boxes

Some INTREPID tools now use a standard dialog box to configure each filter or transformation. With new versions of INTREPID, more tools will use these standard dialog boxes as appropriate.

A typical standard spatial / time filter / transformation dialog box appears below.



Certain features are common to all of these dialog boxes as described in the following sections.

Filter name

For standard INTREPID filters and transformations configured directly in interactive or batch mode, the Name text box shows the filter type.

In the Line Filter tool, for filters configured using a filter definition file, the Name text box shows the name of the filter definition file ahd is used for saving the filter specifications. See "Standard filter names" in Line Filtering (T31) and "Loading and saving filter definitions" in Line Filtering (T31) for details.

Filter space

For spatial and time domain filters and transformations, INTREPID shows this as 'Spatial'.

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Detrending and replacing trends

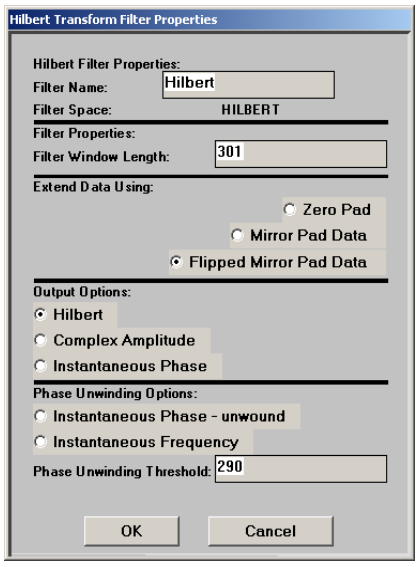
Before applying a filter, INTREPID removes first order trends (overall slope) in the data. If it makes sense to restore the trend after application of the filter, INTREPID will either automatically replace the trend or include a Replace Trend option in the filter properties dialog box. INTREPID will normally replace the trend unless you turn off the Replace Trend check box.

Creating the extended region for filters

To prevent loss of data at the line ends, filters use an extended region at each end of the line, where the values of the first or last original data point can be rolled off to zero.

This is particularly important for the Fuller filter, Hilbert transform and Phillips auto depth estimation.

The properties dialog boxes for these filters contain parameters for specifying the extended region.



INTREPID calculates initial Signal values for the data points in the extended region. These can be based on nearby original data values. See Extended region size and Data extension method for information.

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Extended region size

(Hilbert transformation only)

INTREPID automatically calculates the length of the extended region for the Hilbert transform using the formula

$$p = \frac{(w-1)}{2}$$

where

p = length (data points) of extended region

w = filter window length

INTREPID automatically calculates a suitable extended region size for the other filters.

Data extension method

(Fuller filter, Hilbert transformation, Phillips automatic depth estimation only)

INTREPID has three options for extended region values, as described below. In the dialog box for the filter, select the Data Extension Method option as required.

Zero Pad INTREPID sets all extended region values to zero.

Mirror Pad Data INTREPID extrapolates values so that the profile of the extended region Signal values is a Y reflection of the profile of the Signal values of the same number of original data points at that end of the line.

Flipped Mirror Pad Data INTREPID extrapolates values so that the profile of the extended region Signal values is a Y reflection then an X reflection of the profile of the Signal values of the same number of original data points at that end of the line. This is the default option for spatial domain filters.

Filter definition (`.fdf`) vs kernel (`.ker`) files

Filter definition (`.fdf`) files

Using the Line Filter tool you can save and load filter definition files which specify the type and parameters for a filter. These files have the extension **`.fdf`** and reside in the ***`install_path`*`/filters`** directory (where ***`install_path`*** is the location of your INTREPID installation). Filter definition files can specify spatial or spectral domain filters.

The name of the filter definition file will show in the Name text box of the filter properties dialog box.

See "Loading and saving filter definitions" in Line Filtering (T31) for details.

User defined convolution kernel (`.ker`) files

You can specify a convolution filter using a set of coefficients for multiplying neighbouring data points or grid cells, combining the results and calculating a new value for the target point or cell. INTREPID stores the coefficients in a user defined convolution kernel file with the extension **`.ker`**, residing in the ***`install_path`*`/kernels`** directory (where ***`install_path`*** is the location of your INTREPID installation). See User defined convolution kernelsfor details.

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User defined convolution kernels

(Line Filter, Spatial Convolution Grid Filters, Equivalent Layer only)

When you apply a convolution filter, INTREPID replaces the Signal value of each data point (line datasets), or each grid cell (grid datasets) with a weighted combination of its original value and those of its neighbours, using a set of coefficients. A user defined convolution kernel contains a set of coefficients.

In an INTREPID revision to be released soon you will be able to apply user defined convolution kernels to line datasets using the Line Filter tool (See "Filter operations" in Line Filtering (T31)).

In the current version of INTREPID you can apply user defined convolution kernels to grid datasets using the Spatial Convolution tool (See Spatial Convolution Grid Filters (T34)).

The Weiner Filter tool automatically produces kernels for grid datasets. The Equivalent Layer tool uses these kernel for its operation. See Creating Weiner convolution kernels (T35) and Equivalent Layer corrections (T36) for details.

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User defined grid kernels supplied with INTREPID

The following table describes the predefined convolution kernels typically supplied with INTREPID. Many of these are designed to emulate spectral domain filters (See INTREPID spectral domain operations reference (R14) for further information). The predefined convolution kernels are all standard Earth Resource Mapping kernels. For more information about these kernels, refer to the ERMapper documentation.

Purpose	Kernel type	File names (with extension .ker)
Enhancing peaks and troughs	Downward continuation	**down_cont_half** **down_cont_1** **down_cont_2**
	Horizontal derivative	**hz10_2nd_deriv** **hz13_2nd_deriv** **hz1960_2nd_deriv**
	Second vertical derivative	**secondvertical**
Smoothing	Averaging	**3x3ave**
	Low pass	**low_pass_4**
	Upward continuation	**up_cont_half** **up_cont_1** **up_cont_2**
Enhancing edges	Horizontal edge enhance	**h_edge** **h_edge_5**
	Residual	**residual_1** **residual_2**
	Sharp Edge	**sharpedge**
Extracting particular frequencies	Band pass	**bandpass_3_5**
	High pass	**high_pass_4**
Directional filter	Sun filter	**East_West** **North_South**
Magnetic susceptibility	Weiner	**wiener**

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Structure of convolution kernel definition files

The user defined convolution kernels are INTREPID auxiliary files each containing a **`Kernel Begin – Kernel End`** block. The files reside in the ***`install_path/`*** **`kernel`** directory (where ***`install_path`*** is the location of your INTREPID installation) and have extension **`.ker`**.

The kernel definition file contains definitions of seven parameters. Earth Resource Mapping developed this format as an open standard. INTREPID does not use some of the parameters in the format, but requires them to be present in order for the definition to conform to the standard.

Name contains the name of the filter enclosed in double quotes.

Description contains the description of the kernel. If the text of the description contains spaces it must be enclosed in double quotes **`""`**.

Type = Convolution required by the ERMapper standard.

Rows, Columns The kernel consists of a matrix of coefficients. These parameters specify the number of rows and columns of coefficients in the kernel. If you specify a user defined kernel, INTREPID displays the dimensions in the Status area of the display. There must be an odd number of rows and of columns, so that the kernel can be symmetrical around the target cell.

OkOnSubsampledData = FALSE This statement is required by the ERMapper standard.

Array contains the matrix of coefficients. For ease of reading:

- Enclose the matrix in braces {}.
- Place each row of the matrix in a separate line of the file.
- Place the opening '**`{`**' on the same line as the words **`Array =`**
- Place the '**`}`**' alone on a line under the matrix.
- Separate the coefficients within the rows by spaces.

Scalefactor = 1 required by the ERMapper standard and currently not used by INTREPID.

Example of a convolution kernel definition file

```
Kernel Begin
     Name                = "hz13_2nd_deriv"
     Description         = "HZ13 2nd Derivative"
     Type                = Convolution
     Rows                = 3
     Columns             = 3
     OkOnSubsampledData  = FALSE
     Array               = {
               0.500000 -2.000000  0.500000
               2.000000  6.000000 -2.000000
               0.500000 -2.000000  0.500000
                    }
     Scalefactor         = 1
Kernel End
```


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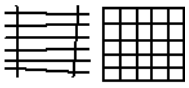
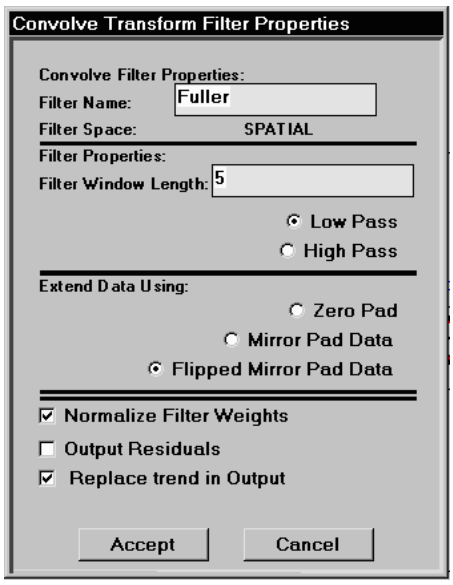
Fuller filter



(Gridding, Levelling, Line Filter, Decorrugation, Microlevelling tools)

The moving average Fuller convolution filter[1] detects high frequency data and passes or rejects it. See User defined convolution kernels for a general explanation of convolution filters. INTREPID can apply the Fuller filter to line or grid data.

The standard Fuller filter dialog box appears below.



Parameters

Window Size (data points) *(standard parameter name)*

Streak Width (m) *(in Decorrugation first (high pass) filter)*

Streak Length (m) *(in Decorrugation second (low pass) filter)*

Secondary filter along correction (m) *(in Microlevelling)*

The window size ('wavelength') corresponds to the maximum width of anomalies to be processed by the Fuller filter (i.e., identified as high frequency).

In the Decorrugation and Microlevelling tools this is measured in metres. In the other tools it is measured as the number of data points.

The window size also corresponds to the number of coefficients used in the Fuller convolution process (one per data point or grid cell in the window).

Normalise filter weights The Fuller filter is a convolution filter with a set of coefficients. You can ensure that the filter does not cause an overall change in the mean of the data by normalising the filter weights (making the coefficients add up to 1).

1. D.C. Fraser, B.D. Fuller and S.H. Ward, Some Numerical Techniques for Application in Mining Exploration, *Geophysics*, vol. XXXI, NO. 6, December, 1966.

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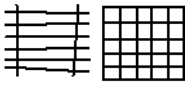
Fuller filter high / low output options *(fixed in Profile Editor (high pass), Levelling (low pass), Decorrugation*[1] (high pass then low pass), Microlevelling (low pass)) You can specify whether a Fuller filter will output the data identified as high frequency *(High Pass)* or output the data with the high frequency component removed *(Low Pass)*. Select the option as required.

Output residuals This option reverses the action of the High Pass / Low Pass options above. If you turn it on, INTREPID will reject the data that it would normally pass and pass the data it would normally reject according to these options.

Replace trend in output *(fixed in Profile Editor, Levelling, Decorrugation, Microlevelling—all turned on)* Before applying the Fuller filter, INTREPID removes first order trends (overall slope) in the data. If this check box is on (this is the default condition), INTREPID will restore this trend after the filter process.

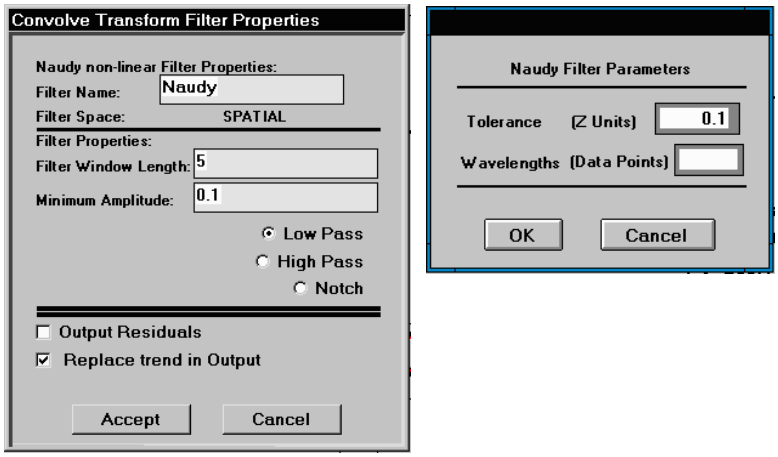
Naudy filter



(Profile Editor, Gridding, Levelling, Line Filter, Decorrugation, Microlevelling tools)

This filter detects sudden changes in your data (i.e., high frequency data). These may be due to noise or spikes that are not characteristic of potential field data. The Naudy filter is commonly used for eliminating noise and spikes.

The standard Naudy filter dialog box and the parameters box from the Profile Editor appear below.



1. INTREPID normally uses a Fuller filter for the second, low pass filter process in Decorrugation

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Parameters

Window Size *(standard parameter name)*

Streak Width (m) *(in Decorrugation first (high pass) filter)*

Streak Length (m) *(in Decorrugation second (low pass) filter)*

Secondary filter along correction (m) *(in Microlevelling)*

The window size corresponds to the maximum width of anomalies to be identified as high frequency. In the Decorrugation and Microlevelling tools this is measured in metres. In the other tools it is measured as the number of line dataset data points.

In 'spectral' terms the window size corresponds to a cutoff wavelength for the filter. Thus 1/(window size) corresponds to the cutoff frequency. The minimum window size is 2, so the maximum frequency is 1/2, or 0.5. Thus frequencies range from 0 to 0.5, and the cutoff frequency lies within this range.

Minimum amplitude, Tolerance *(fixed in Microlevelling, change in Decorrugation task specification files only)* When calculating the Naudy filter result INTREPID will ignore changes with amplitude less than the value of this parameter. Specify the Tolerance in Signal units or grid cell units. The tolerance corresponds to the minimum amplitude of anomalies to be identified as high frequency data. INTREPID will identify an anomaly as high frequency if it has amplitude higher than the tolerance you specify.

The default value 0.1 corresponds to 0.1 nT, the current documented accuracy of magnetometers. This ensures that INTREPID will not waste time attempting to smooth out the normal fluctuations associated with the precision limits of the instrument.

Wavelength *(Profile Editor)* When calculating the Naudy filter result INTREPID will only examine sequences of data points up to the Wavelength as potential noise.

Naudy filter high / low output options

(Fixed in Profile Editor (high pass), Levelling (low pass), Decorrugation[1] (high pass then low pass), Microlevelling (low pass));

(Notch output only available in Line Filter and Gridding)

You can specify whether a Naudy filter will output:

- The data identified as high frequency *(High Pass)*,
- The data with the high frequency component removed *(Low Pass)*,
- The data within a band (notch or range of frequencies) related to the window size *(Notch)*,
- The data outside a band (notch or range of frequencies) related to the window size *(Notch)* with Output Residuals turned on).

Select the option corresponding to your requirement.

To apply the band (notch) option INTREPID applies a high pass Naudy filter then a low pass to the results. This outputs (or rejects) data with frequency close to the specified cutoff frequency of the filter.

1. INTREPID normally uses a Naudy filter for the first, high pass filter process in Decorrugation

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Output residuals This option reverses the action of the High Pass/Low Pass/Notch options above. If you turn it on, INTREPID will reject the data that it would normally pass and pass the data it would normally reject according to these options.

Replace trend in output *(fixed in Profile Editor, Levelling, Decorrugation, Microlevelling—all turned on)* Before applying the Naudy filter, INTREPID removes first order trends (overall slope) in the data. If this check box is on (this is the default condition), INTREPID will restore this trend after the filter process.

4th Difference noise detection

(Profile Editor and Spreadsheet editor only)

This filter calculates the 4th difference of the Signal data. Non-zero 4th difference results indicate sudden changes in the data. See the description of the **`diffn()`** function in Section "INTREPID Functions" in INTREPID expressions and functions (R12) for information about the 4th difference calculation (**`diff4()`**).

Gradient filter

(Profile Editor only)

The gradient filter calculates the slope of the Signal field with respect to time (fiducial). This is a useful indicator of rapid change and therefore a method of identifying noise.

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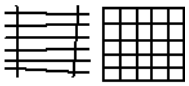
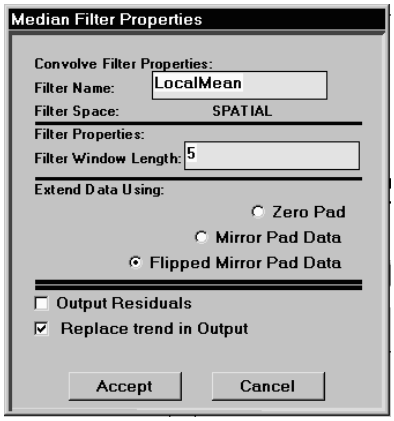
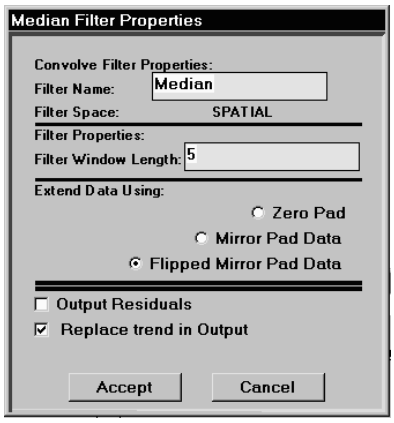
Local mean / median filters

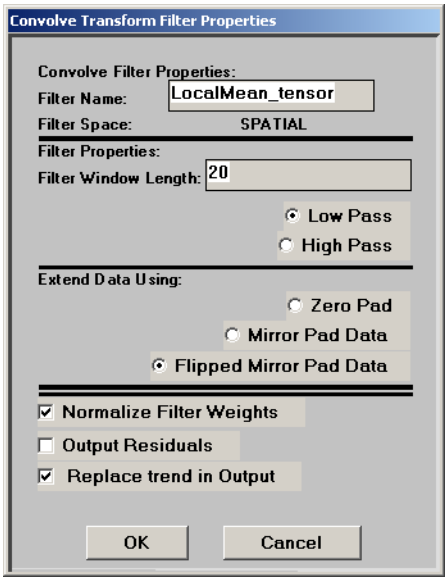


(Mean: Line Filter only; Median: Line Filter and Spatial Convolution Grid Filters only, Local mean-Tensor: Profile Editor) These filters adjust the value of the target cell based on the mean or median value of the cell and its neighbours in a window. For line data this window is a number of data points surrounding the target point. For grid data the window is square with the target cell in the centre.

The standard Local Mean and Local Median filter dialog boxes appear below.







Parameters

Window length Use this text box to specify the width of the filter window. For example, if the width of the filter window is 21, then the new cell value will be calculated from the value of the cell and its 10 neighbours in each direction (Line data: 10 data points on either side of the target point, Grid data: block of cells 10 x 10 with target cell in the centre). The value of parameter cannot be less than 3.

Low Pass, High Pass Contact technical support for information.

Normalise filter weights Contact technical support for information.

Output Residuals *(fixed in Spatial Convolution Grid Filters—turned off)* If you turn on this check box, INTREPID will output the difference between the filter results and the original data.

Replace trend in output *(fixed in Spatial Convolution Grid Filters—turned on)* Before applying the local mean / median filter, INTREPID removes first order trends (overall slope) in the data. If this check box is on (this is the default condition), INTREPID will restore this trend after the filter process.

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Local Maximum filter

The local maximum filter operates in a similar way to the existing Local Mean and Local Median filters. It sets the value of the target data point to the maximum value found in the window.

Automatic gain control and contrast normalisation

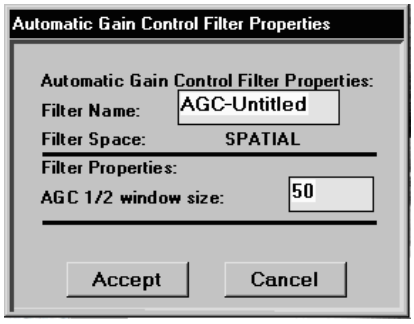
The automatic gain control (AGC) and contrast normalisation filters uses an averaging process to reduce the amplitude variance of the data. This can amplify smaller anomalies and dampen larger anomalies so that all anomalies appear more similar. This is useful for enhancing smaller anomalies and reducing any tendency of larger anomalies to 'drown out' the signal.

Automatic gain control filter for line data

(Line Filter only)

INTREPID processes each data point input value using the values in a surrounding window. It divides the input value by the root mean square of the points in the window.

The AGC filter dialog box appears below.



Parameters

AGC 1/2 Window size Number of data points in the AGC window. The default value is 5.

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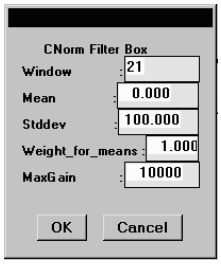
Contrast normalisation filter for grid data

(Spatial Convolution Grid Filters only)

The Contrast Normalisation filter is a non-linear space variant stretch filter that will enhance the low amplitude, high frequency content, and dampen the high amplitude content. It has a similar effect to an automatic gain control filter (See Automatic gain control and contrast normalisation).

The Contrast Normalisation filter dialog box appears below.



Parameters

Window Use this text box to specify the width of the filter window. For example, if the width of the filter window is 21, then the new target cell value will be calculated from the value of the cell and its 10 neighbours in all directions.

Mean Use this text box to specify the desired mean of the output.

Stddev Use this text box to specify the desired standard deviation of the output.

Weight for Means Use this text box to specify the weighting to apply to the desired mean versus the local mean of the window.

The closer the weighting to 0, the more biassed result will be towards the local mean of the window. If the weighting is equal to 0 the filter will use the local mean of the window and ignore your desired mean.

The closer the weighting to 1, more biassed the results will be towards the desired mean. If the weighting is equal to 1 the filter will use your desired mean and ignore the local mean of the window.

Essentially this has the effect of dampening regional trends when you use a value closer to 1. Setting the value to 0 preserves the regional component.

MaxGain The maximum gain is an amplification limit for data output by the filter. A cell may not deviate more than the value of this parameter from the mean of the cells in the window.

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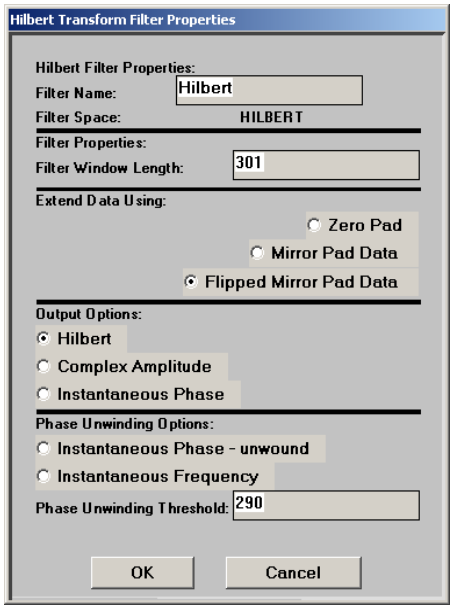
Hilbert transform

(Gridding, Line Filter only)

The Hilbert Transform filter uses a finite difference operator to calculate an imaginary component of the input (Quadrature). It uses this as the filter result or combines it with the existing real component to give the Instantaneous Phase or Instantaneous Frequency.

The standard Hilbert transform dialog box appears below.



Parameters

Filter Properties

Filter Window Length The number of data points used by the Hilbert Transform finite difference operator. The default value is 19 (i.e., 9 points on each side of the target point). The value of parameter cannot be less than 9.

Output Options

Quadrature This is the imaginary component of the input signal derived using the Hilbert transform. The Hilbert Transform includes a detrending process. You can choose whether to replace the trend in the filter results using the two Quadrature options:

Quadrature—(local) trend replaced

Quadrature—(local) trend removed

Even though the Hilbert transform is not connected with the spectral domain, you can find a relevant discussion of detrending in section"Detrending data values" in INTREPID spectral domain operations reference (R14)

Complex Amplitude This is the magnitude of sum of the input data (real component) and the Quadrature results (imaginary component).

$$\text{complex amplitude} = \sqrt{\text{real}^2 + \text{imaginary}^2}$$

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Instantaneous Phase This is derived by combining the input data (real component) and the Quadrature results (imaginary component) using the formula

$$\text{instantaneous phase} = \text{atan}\left(\frac{\text{imaginary}}{\text{real}}\right)$$

Instantaneous Phase can show continuity for subtle features often lost when you only examine the real component. See the articles Taner, Koehler and Sheriff (1979)[1] and Fitzgerald, Yassi, and Dart (1997)[2] for further discussion of this technique.

Unwound Instantaneous phase results have data jumps due to the spiralling nature of the filter. INTREPID can correct this using a surface consistent partial unwrapping algorithm. Select this option to produce unwrapped instantaneous phase results.

Instantaneous Frequency This is a measure of change in the Instantaneous Phase (see previous section), comparing adjacent values of Instantaneous Phase results. It uses the formula

instantaneous frequency = diff1(instantaneous phase)

See "DIFF function example" in INTREPID expressions and functions (R12)for an illustration of this function.

1. Taner, M.T., Koehler, F. and Sheriff, R.E., 1979, Complex seismic trace analysis: *Geophysics* 44, 1041–1063.

2.Fitzgerald, D., Yassi, N. and Dart, P., 1997, A case study on geophysical gridding techniques: INTREPID perspective: *Exploration Geophysics*, 28, 1–

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Phillips automatic depth estimation

(Line Filter only)

The Phillips method estimates from the Signal field signal the depth to a magnetic basement. It assumes a 2-D magnetic basement can be approximated by an assemblage of thin vertical (or near-vertical) dykes. It uses autocorrelation functions of magnetic anomalies due to such dykes. These functions are in a form that is independent of magnetic inclination and dip. Depth estimates are calculated using combinations of autocorrelation functions at various lags.Consistent depth estimates using a range of different lags are interpreted to mean a valid depth estimate.

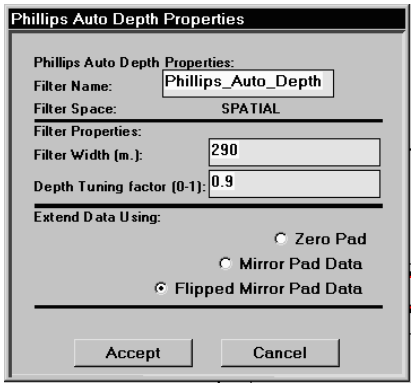
The best results occur when the window length matches the wavelength of the magnetic responses.

INTREPID expresses the results in the same units as the X and Y fields of the dataset. Depth Estimate values are negative numbers with 0 corresponding to the survey height.[1]

See also "Querying the power spectrum graph (OldGridFFT)" in Old spectral domain grid filters (OldGridFFT) (T38)for information about the Spector Grant depth estimation method used in the spectral domain.

See also Naudy Automatic Model interpretation (T43) and Euler Deconvolution (T44) for further depth estimation techniques.

The standard Phillips Automatic Depth Estimation dialog box appears below.



Parameters

Filter width (m) The filter width must correspond to the maximum magnetic basement depth sought. The default value is 290 m.

Depth tuning factor Use this to vary the primary and secondary depth estimate 'quality of fit' criteria. INTREPID will multiply the criteria by the factor you specify.

1. Phillips, Jeffrey D., (1979) *ADEPT: A program to estimate depth to magnetic basement from sampled magnetic profiles* Reston, Virginia, U.S. Geological Survey Open File Report 79–367.

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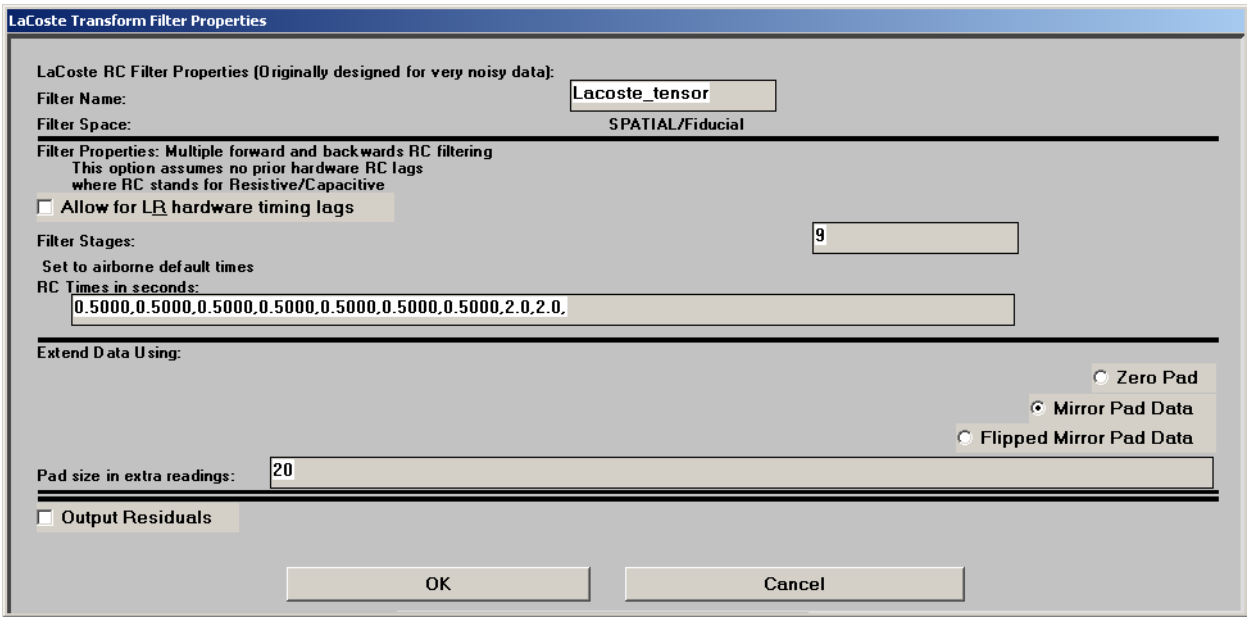
Lacoste RC filter

(Line Filter and Profile Editor (compound data filters)

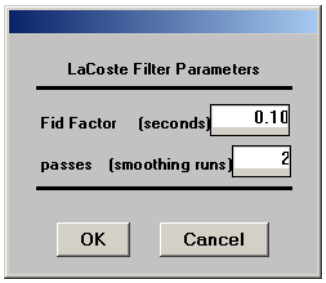
The Lacoste RC (Resistive/Capacitive) filter was originally designed using analog circuits, for filtering very noisy marine data. Its digital equivalent can be used to filter stabilised platform monitor data which contains a great deal of high frequency noise from the movement of the ship acquiring data.

Some properties of the Lacoste filter are:

- The filter is highly linear
- The filter leaves a local trend in the data
- The first 3 stages of the filter compensate for the acquisition instrument phase lag. In the case of the LaCoste and Romberg S-meter, the firmware performs 3 stages of 20 second forward lag filtering only. The Lacoste filter compensates for this by performing 3 stages of 20 second reverse lag only. Successive filter stages are then run in pairs, to eliminate any phase lag.



If you select the curvature version, INTREPID displays a further dialog box



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Parameters

Filter Stages Number of stages in the filter

RC Times in seconds Time in seconds for each filter stage.

Example 1 Lacoste 9-stage RC noise filter.

This filter does 3 stages of 1 way backwards, then 3 stages of 2-way filtering

20.0, 20.0, 20.0, 27.0, 27.0, 27.0, 27.0, 27.0, 27.0,

eg 20 sec back, 20 sec back, 20 sec back, (27 sec forward, 27 sec back) x 3

To calculate the length of the filter, add the numbers up (they are in seconds).

so 20+20+20 = 60 sec, one minute,

and 6 * 27 = 162 sec, about 2.7 minute,

making a total of 222 sec, or 3.7 minutes.

If you don't wish to introduce any phase lag into your data, design the filter accordingly.

Example 2 Lacoste 6-stage RC 106 second noise filter.

This filter does 3 stages of 1 way backwards, then 1 stage of 1-way forward filtering, then 1 stage of 2-way filtering.

10 10 10, 30, 23 23

(eg: 10 sec back, 10 sec back, 10 sec back, 30 sec forward, 23 sec back, 23 sec forward)

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Gravity Inversion

(Line Filter only)

This is an implementation of the paper by Murthy & Rao, from Computers & Geosciences, Vol 15 No. 7 pp1149-1156

A profile of gravity data is inverted to yield either:

- Depths to the top of the basement surface below each point of gravity anomalies
- Anomaly of structure

Parameter input

Z Depth above which the structure or density Surface is to be calculated, km

Dc Density contrast, gm/cc, default is 400

Optional Parameters to aid convergence

Ztlt Minimum depth to interface, km, default is 1000 m.

Zblt Maximum depth to interface, km, default is 4000 m.

Parameter output

Either

Zt Depth to interface in km

OR

Gcal Anomaly of structure calculated, in mgals

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Strip Gravity Layer

(Line Filter only)

A simple filter to calculate the gravitational effect of a layer of variable thickness.

It is based upon using the formula for the gravitational effect for a Prism

Parameter input

Zbot Depth to bottom of layer

Ztop Depth to top of layer, default is 0.0

Dc Density contrast, gm/cc

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